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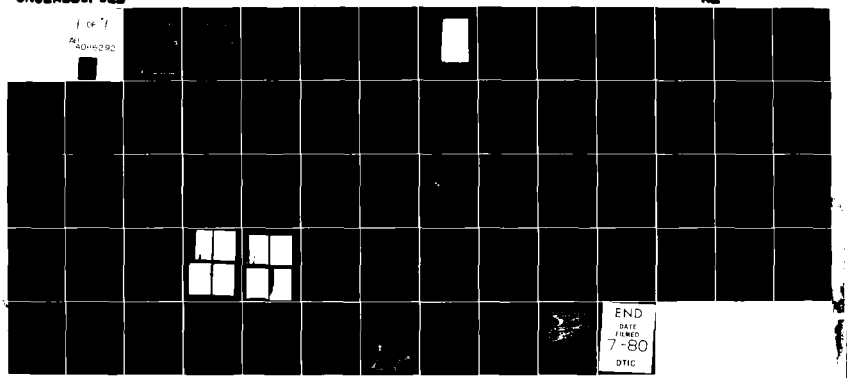

SUSQUEHANNA RIVER BASIN

WASTE HOUSE RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

WASTE HOUSE RUN NO. 3 DAM

NDS ID NO. PA-684

DER ID NO. 54-26

LEVEL II

AD A085292

MAHANOY TOWNSHIP MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

L. ROBERT KIMBALL & ASSOCIATES

DACW31-80-C-0020

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Prepared By

L. ROBERT KIMBALL & ASSOCIATES

CONSULTING ENGINEERS & ARCHITECTS

EBENSBURG, PENNSYLVANIA

15931

FOR

DEPARTMENT OF THE ARMY

BALTIMORE DISTRICT CORPS OF ENGINEERS

BALTIMORE, MARYLAND

21203

APRIL, 1980

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SUSQUEHANNA RIVER BASIN

WASTE HOUSE RUN, SCHUYLKILL COUNTY

(1)

(6) National Dam Inspection Program.

PENNSYLVANIA

WASTE HOUSE RUN NO. 3 DAM

NDSID Number PA-68[redacted] Number

DER ID Number 54-26[redacted]

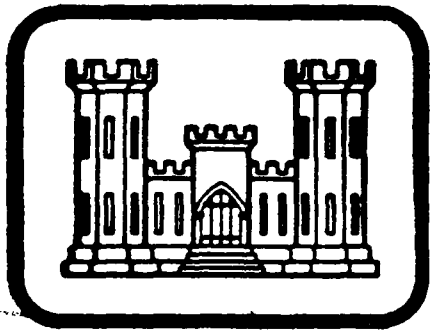
Susquehanna River Basin, Waste House Run

~~MAHANOY TOWNSHIP MUNICIPAL AUTHORITY~~

Schuylkill County, Pennsylvania.

PHASE I INSPECTION REPORT,

NATIONAL DAM INSPECTION PROGRAM



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R. Jeffrey Kimball

411059

Prepared By

L. ROBERT KIMBALL & ASSOCIATES

CONSULTING ENGINEERS & ARCHITECTS

EBENSBURG, PENNSYLVANIA

15931

(15) DACW31-80-C-0020

FOR

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21203

APRIL, 1980

411059

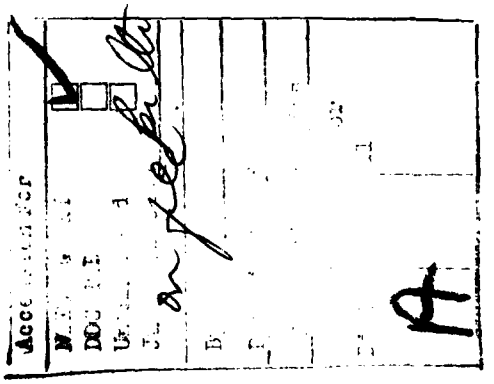
PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in detemining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	Waste House Run No. 3 Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	Schuylkill
STREAM	Waste House Run
DATE OF INSPECTION	November 8 and 16, 1979

ASSESSMENT

The assessment of Waste House Run No. 3 Dam is based upon visual observations made at the time of inspection, interviews with the owner and hydrologic and hydraulic analyses.

Waste House Run No. 3 Dam is a high hazard-intermediate size dam. The dam is in fair condition. The spillway design flood is the PMF (Probable Maximum Flood). The spillway and reservoir are capable of controlling approximately 55% of the PMF without overtopping the embankment. Based on criteria established by the Corps of Engineers, the spillway is termed inadequate. Seepage is exiting at several locations at the toe of dam. One of these seepage areas is approximately 8 feet above the toe of dam on the upstream wall of the valve house. Significant movement of the downstream slope and walls of the valve house are in evidence and additional analyses are warranted.

The following recommendations and remedial measures should be instituted immediately.

1. The spillway control section (weir) should be repaired.

2. A detailed study, including a stability analysis, should be conducted by a registered professional engineer knowledgeable in earth dams to evaluate the seepage, movement of the walls in the valve house and possible downstream slope instability. The study should include monitoring and testing as required.

3. All brush, trees and debris should be cleared from the spillway.

4. All brush and trees should be cleared from the slopes and crest under the direction of a professional engineer knowledgeable in the design and construction of earth dams.

5. All seepage areas should be monitored on a regular basis and after periods of heavy precipitation and evaluated by a profesional engineer knowledgeable in dam design and analyses.

6. Some means of upstream positive closure of the drainline should be developed in the case of emergencies.

7. The leaking valves located in the valve house should be repaired and exercised and lubricated on a regular basis.

8. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

9. Regular safety inspections should be conducted in accordance with provisions stipulated by the Commonwealth of Pennsylvania regarding the inspection of dams.

10. Improve the access to the dam so the dam will be accessible during periods of flooding.

SUBMITTED BY:

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS

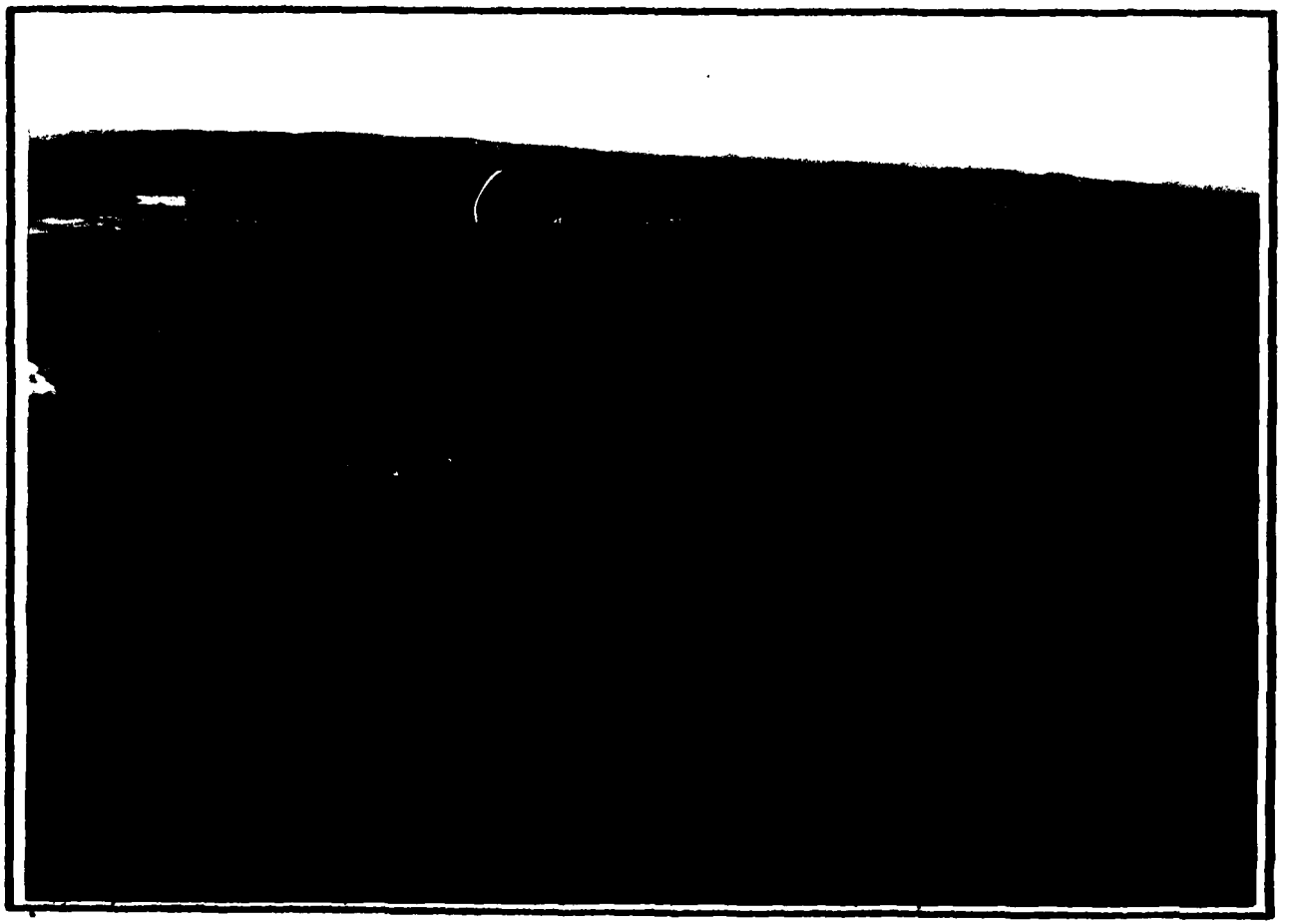
April 11, 1980
Date

R. Jeffrey Kimball, P.E.

APPROVED BY:

16 May 1980
Date

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer



Overview of Waste House Run No. 3 Dam.

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APPENDICES

PHASE I
NATIONAL DAM INSPECTION PROGRAM
WASTE HOUSE RUN NO. 3 DAM
NDI. I.D. NO. PA 684
DER I.D. NO. 54-26

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Waste House Run No. 3 Dam is an earthfill dam, 41 feet high and 1080 feet long. The crest width of the dam is 7 feet. The upstream slope is 2.5H:1V and protected with hand placed riprap. The downstream slope is 1.5H:1V and covered with stone rubble. A puddle ditch, to cutoff seepage, is carried to bedrock.

The spillway is located on the right abutment and is excavated into the hillside. The weir is 34 feet long and is trapezoidal shaped. The spillway exit channel is 280 feet long at a 2% grade. The bottom and side slopes of the spillway are protected with hand placed riprap.

The reservoir outlet is provided by a 20 inch diameter cast iron pipe which terminates in a gate house at the downtream toe of the dam. There are two valves in the gate house to regulate the flow. Water discharges from the pipe into the old creek bed and flows into Waste House Run No. 2 Dam which is located 3000 feet downstream of Waste House Run No. 3 Dam. The pipe is carried through the dam on a masonry wall resting upon the underlying bedrock and encased in concrete. Two cutoffs are provided along the pipe.

b. Location. The dam is located on Waste House Run, approximately 3 1/2 miles northeast of Shenandoah, Schuylkill, Pennsylvania. Waste House Run No. 3 Dam can be located on the Shenandoah, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. Waste House Dam No. 3 is an intermediate size dam (41 feet high, 239 acre-feet).

d. Hazard Classification. Waste House Run No. 3 Dam is a high hazard dam. Downstream conditions indicate that loss of more than a few lives is probable should the structure fail. Another reservoir, Waste House Run No. 2 Dam, is located 3000 feet downstream of Waste House Run No. 3 Dam. Approximately 2000 feet downstream of Waste House Run No. 2 Dam is a mine complex and several dwellings.

e. Ownership. Waste House Run No. 3 Dam is owned by the Mahanoy Township Authority. Correspondence should be addressed to:

George Palmer, Manager
Mahanoy Township Authority
46 North Main Street
Mahanoy City, PA 17948
(717) 773-0650

f. Purpose of Dam. Waste House Run No. 3 Dam is used for water supply.

g. Design and Construction History. Waste House Run No. 3 Dam was designed by George S. Clemens, an engineer for the Philadelphia & Reading Coal and Iron Company. Construction began in June, 1901 and finished in October, 1902, under the supervision of John H. Pollard, an engineer for the P & R Coal and Iron Company. The embankment was constructed of a mixture of clay and gravel which was laid in six inch layers, sprinkled and rolled with a grooved roller. Several springs appeared during the construction of the foundation. One of these springs was located in the puddle ditch and was controlled by means of a french drain, covered with concrete, and drained by a 6 inch pipe encased in concrete and outletted below the toe of dam. Another spring developed on the west side near the upstream toe which was boxed in concrete and drained by a 6 inch pipe encased in concrete to the sluiceway at the lower end at the outlet pipe.

h. Normal Operating Procedures. The reservoir level is maintained at the spillway crest elevation. The outlet pipe has remained closed for several years. The excess inflow is discharged through the spillway.

1.3 Pertinent Data.

a. Drainage Area. 0.37 square miles

b. Discharge at Dam Site (cfs).

Maximum known flood at dam site	Unknown
Drainline capacity at normal pool	Unknown
Spillway capacity at top of dam	490

c. Elevation (U.S.G.S. Datum) (feet). - Field survey based on pool elevation 1713.0 shown on U.S.G.S. 7.5 minute quadrangle.

Top of dam - low point	1715.7
Top of dam - design height	Unknown
Normal pool	1713.0
Spillway crest	1713.0
Streambed at centerline of dam	1674.8
Toe of dam	1674.8

d. Reservoir (feet).

Length of maximum pool	850
Length of normal pool	800

e. Storage (acre-feet).

Normal pool	193
Top of dam	239

f. Reservoir Surface (acres).

Top of dam	20
Normal pool	15.2
Spillway crest	15.2

g. Dam.

Type	Earthfill
Length	1080'
Height	41'
Top width	7'
Side slopes - upstream	2.5H:1V
- downstream	1.5H:1V
Zoning	Yes
Impervious core	Puddle core
Cutoff	None
Grout curtain	None

h. Reservoir Drain.

Type	20" CIP
Length	Approximately 240'
Closure	Valve at toe
Access	Downstream end
Regulating facilities	Valve at toe

i. Spillway.

Type	Trapezoidal
Bottom width	34'
Crest elevation	1713'
Upstream channel	Lake
Downstream channel	280' long trapezoidal channel

SECTION 2
ENGINEERING DATA

2.1 Design. No data was provided by the owner pertaining to the design of the dam. Some data was available from the Commonwealth of Pennsylvania, Department of Environmental Resources pertaining to construction of the dam, inspection reports, photographs and correspondence.

2.2 Construction. A minimum amount of construction information was available from a report prepared in 1914 and contained in the Commonwealth of Pennsylvania files. (See section 1.2g).

2.3 Operation. No operating records are maintained.

2.4 Evaluation.

a. Availability. No engineering data was provided by the owner. Some background data was provided by PennDER. A representative of the owner accompanied the inspection team to answer questions on any operations or maintenance of the dam.

b. Adequacy. The information available is not sufficient to conduct a detailed engineering study. The Phase I report is completed based upon data obtained from the PennDER files, visual inspection and hydrologic analyses, only.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of Waste House Run No. 3 Dam was conducted by personnel of L. Robert Kimball and Associates on November 8 and 16, 1979 accompanied by representative of the owner. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection, it was noted that the crest of the dam contained two low spots located in the center of the embankment. The crest width is seven feet. The upstream slope was measured to be 2.5H:1V and covered with hand placed riprap. In addition, the upstream slope is covered with small trees. The downstream slope was measured to be 1.5H:1V and covered with stone rubble. Portions of the downstream slope are covered with small trees. The stone rubble on the downstream slope to the left of the valve house is characterized by a longitudinal break in slope approximately 15 feet above the toe of dam. Along this lineament the stone rubble appears to be thicker than normal. It appears that the downstream slope or stone rubble may have slid at one time or additional material was added. Based on information obtained in the 1914 report in the PennDER files and observations from the visual inspection, it appears that several feet of material has been added to the crest of the dam and the spillway weir raised. The PennDER report indicates that the upstream slope, downstream slope and crest are all covered with hand placed riprap. This hand placed riprap on the crest and downstream slopes were not in evidence during the visual inspection. In addition, the walls on the valve house, located at the toe of dam, are cracked and moving.

Several seepage areas were noted during the inspection at or below the toe of dam. An extensive wet area is located at the toe of dam and was measured at a collection point to be 3 gallons per minute. Another seepage area was noted to the right of the valve house and was measured at 2 gallons per minute. A third area of seepage was located near the exit of the reservoir drain. This seepage was estimated at 2 gallons per minute and

may be a collection point for seepage exiting along the upstream wall and inside of the valve house (approximately 8 feet above the toe of dam). For location of these wet areas see page A-12.

c. Appurtenant Structures. The outlet conduit consists of 20 inch cast iron pipe which terminates in the gate house at the downstream toe of the dam. Two valves are located in the valve house to regulate the flow through the line. In the valve house the 20 inch line is diverted into two lines consisting of a 24 inch cast iron pipe and a 10 inch cast iron pipe. These two pipes discharge immediately below the valve house and into Waste House Run. The pipe is reportedly carried through the dam on a masonry wall resting on the bedrock and encased in concrete. A considerable amount of water was leaking from the valves and inside the valve house. The valves were not operated during the inspection nor have they been operated recently.

The spillway consists of an open cut located on the right abutment. The spillway weir is 34 feet long with 2:1 sideslopes. The spillway exit channel is approximately 280 feet long and consists of a stone paved open cut which is trapezoidal shaped. Some small trees and debris are located in the spillway and spillway exit channel.

d. Reservoir Area. The watershed is covered mostly with timberland. The reservoir slopes are gentle and are not susceptible to massive landslides which would affect the storage volume of the reservoir or overtopping of the dam by displacing water.

e. Downstream Channel. The downstream channel of Waste House Run No. 3 Dam is narrow and confined for the first 5000 feet downstream of the dam. Approximately 3000 feet downstream of the dam is Waste House Run No. 2 Dam. Approximately 5000 feet downstream Waste House Run passes beneath a railroad embankment and enters a strip mine area. Approximately 2 miles downstream Waste House Run passes through an extensive mining complex.

3.2 Evaluation. In general, the embankment and appurtenant structures appear to be in fair condition, but poorly maintained. Based on evidence obtained from the visual inspection and from data contained in PennDER files, it appears that the top of dam has been raised and/or modified. The downstream slope appears to be moving and has caused structural damage to the valve house. The seepage areas located at the toe of dam should be monitored at a regular basis.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures. The reservoir water surface is maintained at the spillway crest elevation 1713.0. Water has not been drawn off the reservoir for several years. Excess inflow discharges over the spillway crest.

4.2 Maintenance of the Dam. No planned maintenance schedule exists. Maintenance of the dam is considered poor and is performed by the Municipal Authority's staff.

4.3 Maintenance of Operating Facilities. Maintenance of the operating facilities is considered poor. The owner's representative was unaware of the reservoir drain being operated in the past few years.

4.4 Warning System in Effect. At the time of the inspection no system was in effect to warn downstream residents of large spillway discharges or imminent failure of the dam.

4.5 Evaluation. Maintenance of the dam and operating facilities is considered poor. There is no warning system in effect to warn downstream residents.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. A report prepared in 1914 by PennDER indicates that the spillway capacity is 925 cfs. Our calculations indicate that the spillway capacity is approximately 490 cfs. This reduction in the spillway capacity supports the observations that the crest of the spillway and embankment were raised at some point in time.

b. Experience Data. No rainfall, runoff or reservoir level data were available. The spillway reportedly has functioned adequately in the past.

c. Visual Observations. The spillway appears to be in fair condition, but poorly maintained. Brush and small trees growing in the spillway have been left unattended and debris is collecting in the spillway channel.

Two low spots were located in the middle of the embankment.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. Initial water level before flood was at the spillway crest elevation 1713.0.

2. The top of dam was considered to be the low point of 1715.7.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	1012 cfs
Spillway capacity	490 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for this dam is the PMF. The SDF is based on the hazard and size classification of the dam. Based on the following definition provided by the Corps of Engineers, the spillway is rated as inadequate as a result of our hydrologic analysis.

> Inadequate - All high hazard dams which do not pass the SDF (PMF), but where failure due to overtopping does not significantly increase the hazard for loss of life downstream.

The spillway and reservoir are capable of controlling approximately 55% of the PMF without overtopping the embankment. A computer printout of the hydrology is included in Appendix D.

5.4 Summary of Dam Breach Analysis. As the subject dam can satisfactorily pass 50% of the PMF without failure (based on our analyses) it was not necessary to perform a breach analysis and downstream routing of the flood wave.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Based on the data contained in the PennDER files and from observations from the visual inspection, it is apparent that the crest of the dam and spillway have been raised in the past. The crest of the dam and downstream slope have been modified. There is no data documenting this post construction change. It is evident that some movement of the downstream slope has taken place in the past. The lineament and thickening of the stone rubble located to the right of the valve house on the downstream slope and movement of the upstream wall of a valve house support this conclusion. The seepage areas outlined in Section 3.1b indicate a seepage rate of approximately 7 gallons per minute (at the time of inspection). The wet area located on the upstream wall of the valve house is approximately 8 feet above the toe of dam. All of these observations indicate that a stability analysis of the structure is warranted.

b. Design and Construction Data. A small amount of design data is available in the PennDER files. However, no stability analyses have been performed.

c. Operating Records. No operating records are maintained.

d. Post Construction Changes. As outlined in Sections 3.1b and 6.1a it is obvious that some post construction changes have been made to the dam, but not documented.

e. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analyses has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in fair condition. The visual observations and hydrologic and hydraulic calculations indicate that Waste House Run No. 3 Dam's spillway is inadequate. The spillway control section has deteriorated and should be repaired. The spillway is capable of controlling approximately 55% of the PMF without overtopping the earth embankment. The significant movement of the downstream slope rubble, movement of the walls of the valve house, seepage areas, and high level of seepage on the upstream wall of the valve house indicate that a stability analyses is warranted. No stability analyses are on record for this dam.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. Necessity for Further Investigation. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required by a professional engineer knowledgeable in dam design and analysis.

7.2 Recommendations/Remedial Measures.

1. The spillway control section (weir) should be repaired.

2. A detailed study, including a stability analysis, should be conducted by a registered professional engineer knowledgeable in earth dams to evaluate the seepage, movement of the walls in the valve house and possible downstream slope instability. The study should include monitoring and testing as required.

3. All brush, trees and debris should be cleared from the spillway.

4. All brush and trees should be cleared from the slopes and crest under the direction of a professional engineer knowledgeable in the design and construction of earth dams.

5. All seepage areas should be monitored on a regular basis and after periods of heavy precipitation and evaluated by a professional engineer knowledgeable in dam design and analyses.

6. Some means of upstream positive closure of the drainline should be developed in the case of emergencies.

7. The leaking valves located in the valve house should be repaired and exercised and lubricated on a regular basis.

8. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

9. Regular safety inspections should be conducted in accordance with provisions stipulated by the Commonwealth of Pennsylvania regarding the inspection of dams.

10. Improve the access to the dam so the dam will be accessible during periods of flooding.

APPENDIX A
CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Waste House No. 3 Dam COUNTY Schuylkill STATE Pennsylvania ID# PA 684

TYPE OF DAM Earthfill and rockfill HAZARD CATEGORY High

DATE(s) INSPECTION November 8 and 16, 1979 WEATHER Cloudy, warm TEMPERATURE 50°

POOL ELEVATION AT TIME OF INSPECTION 1713.0 M.S.L. TAILWATER AT TIME OF INSPECTION None. M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball - L. Robert Kimball and Associates

James T. Hockensmith - L. Robert Kimball and Associates

O.T. McConnell - L. Robert Kimball and Associates

James T. Hockensmith
RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	There is some unusual slope movement on the downstream slope to the right of the valve house. This is evident by thickening of the stone rubble and a horizontal lineament.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	See above.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal appears to be good. Vertical alignment spot. See page A-12.	low
RIPRAP FAILURES	None noted.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Both the upstream and downstream slopes contain small trees.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good.	
ANY NOTICEABLE SEEPAGE	Three seepage areas located at the toe of the dam and a wet area on the upstream wall of the valve house. See page A-12 for location.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	Construction history indicates that two drains were provided to control springs located during construction. These were not evident during inspection.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Not applicable.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not applicable.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Not applicable.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not applicable.	
STRUCTURAL CRACKING	Not applicable.	
VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable.	
MONOLITH JOINTS	Not applicable.	
CONSTRUCTION JOINTS	Not applicable.	
STAFF GAUGE OR RECORDER	Not applicable.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Outlet pipe not observed during the inspection. The valves in the valve house were leaking.	
INTAKE STRUCTURE	Unobserved.	
OUTLET STRUCTURE	Pipes discharge directly to Waste House Run. Valve house in very deteriorated condition.	
OUTLET CHANNEL	Waste House Run.	
EMERGENCY GATE	Valve at downstream toe of dam.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Deteriorated. Needs to be repaired.	
APPROACH CHANNEL	Lake.	
DISCHARGE CHANNEL	Trapezoidal shaped. Open cut with hand placed stone riprap.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

DOWNSTREAM CHANNEL

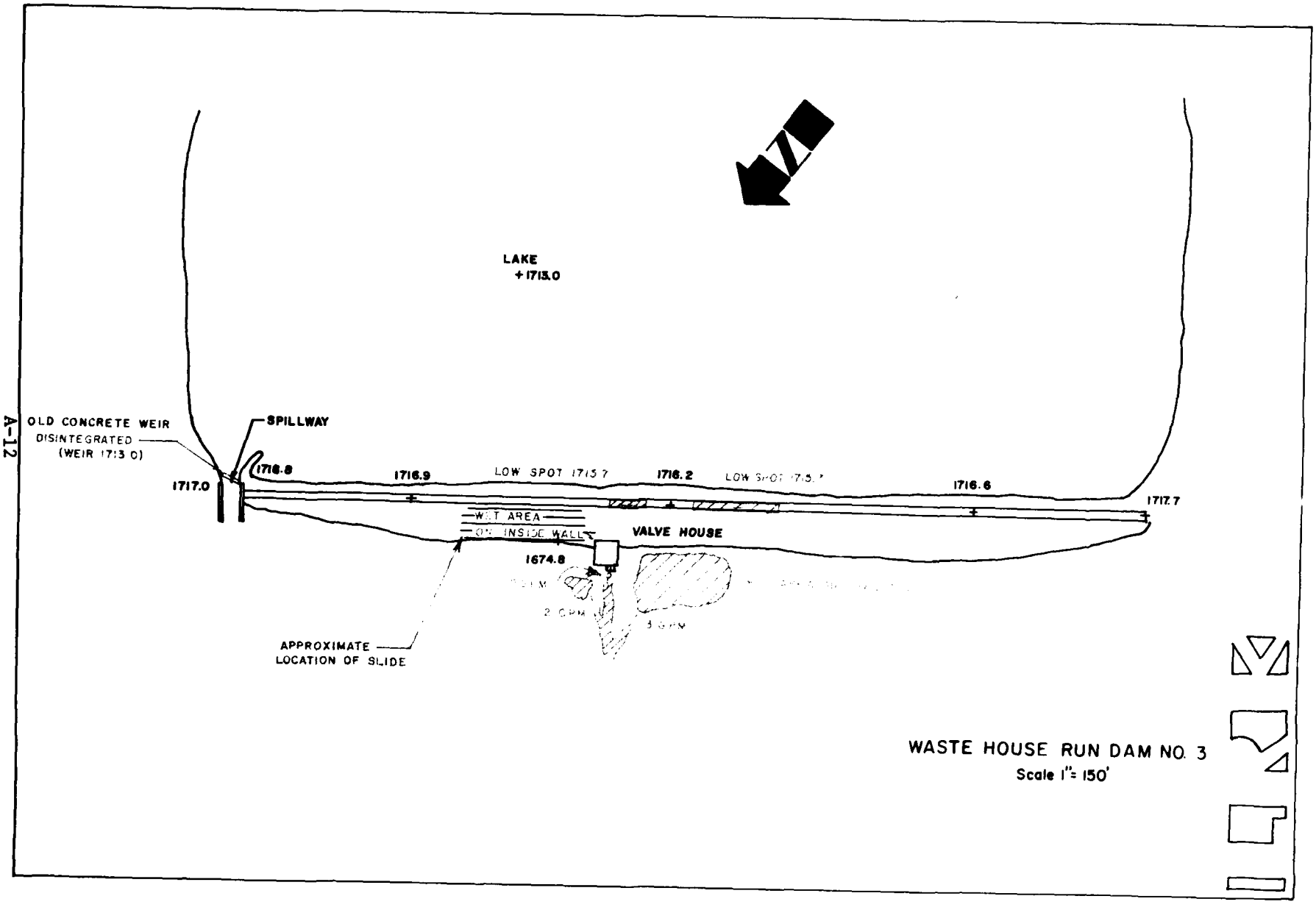
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Steep, narrow and confined. Approximately 3000 feet downstream is Waste House Run No. 2 Dam. Approximately 1 mile downstream is a culvert and railroad embankment.	
SLOPES	Gentle. Appear to be stable.	
APPROXIMATE NO. OF HOMES AND POPULATION	Mining complex and several dwellings, 50 people.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate. Appear to be stable.	
SEDIMENTATION	Does not appear to be excessive.	

INSTRUMENTATION

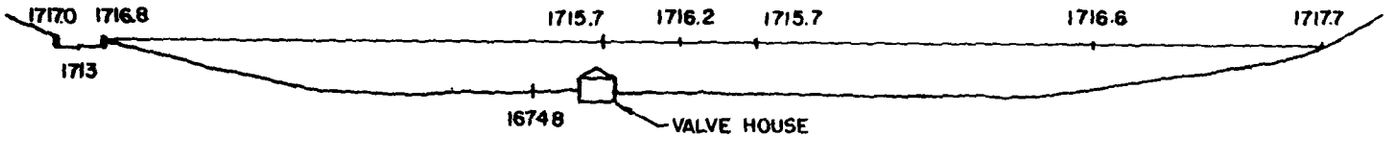
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	



WASTE HOUSE RUN DAM NO. 3
Scale 1"= 150'

SPILLWAY PROFILE

(Not to Scale)



PROFILE
LOOKING UPSTREAM

WASTE HOUSE RUN DAM NO. 3

Scale 1" = 150'

APPENDIX B
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Waste House Run No. 3 Dam

ID# PA 684

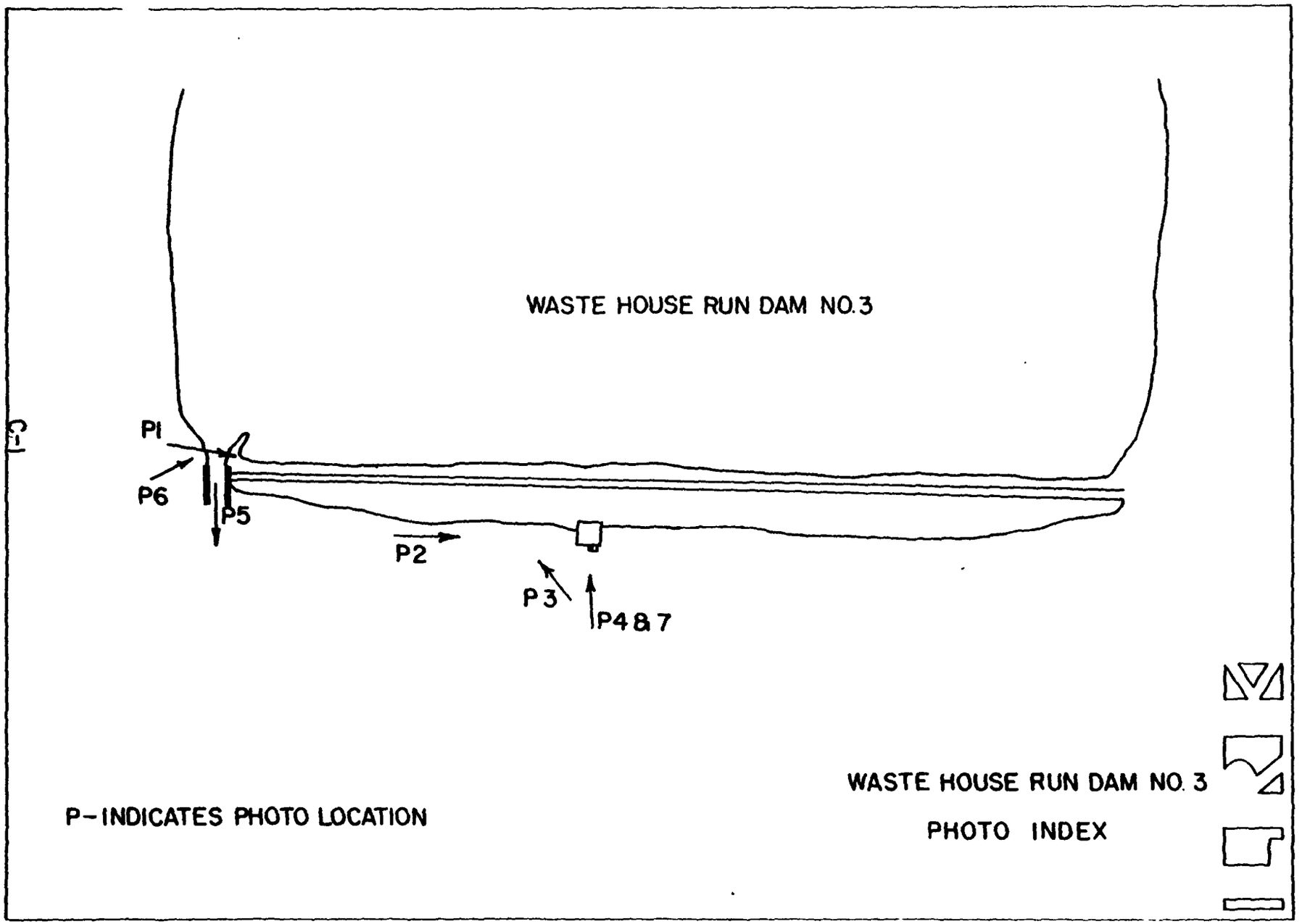
ITEM	REMARKS
AS-BUILT DRAWINGS	One drawing, poor condition showing the foundation drains collecting water from the springs.
REGIONAL VICINITY MAP	U.S.G.S. quadrangle.
CONSTRUCTION HISTORY	Brief history outlined in PennDER files. See Section 1.2g.
TYPICAL SECTIONS OF DAM	None.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	None. None. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None.
POST-CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Not documented.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown.
MAINTENANCE OPERATION RECORDS	None.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	None.
OPERATING EQUIPMENT PLANS & DETAILS	None.

APPENDIX C
PHOTOGRAPHS


WASTE HOUSE RUN DAM NO.3
P1
P6
P5
P2
P3
P4&7
P-INDICATES PHOTO LOCATION
WASTE HOUSE RUN DAM NO. 3
PHOTO INDEX

WASTE HOUSE RUN NO. 3 DAM

Photograph Descriptions

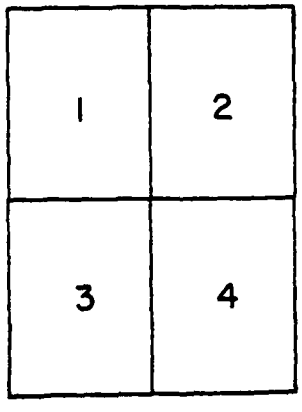
Sheet 1. Front

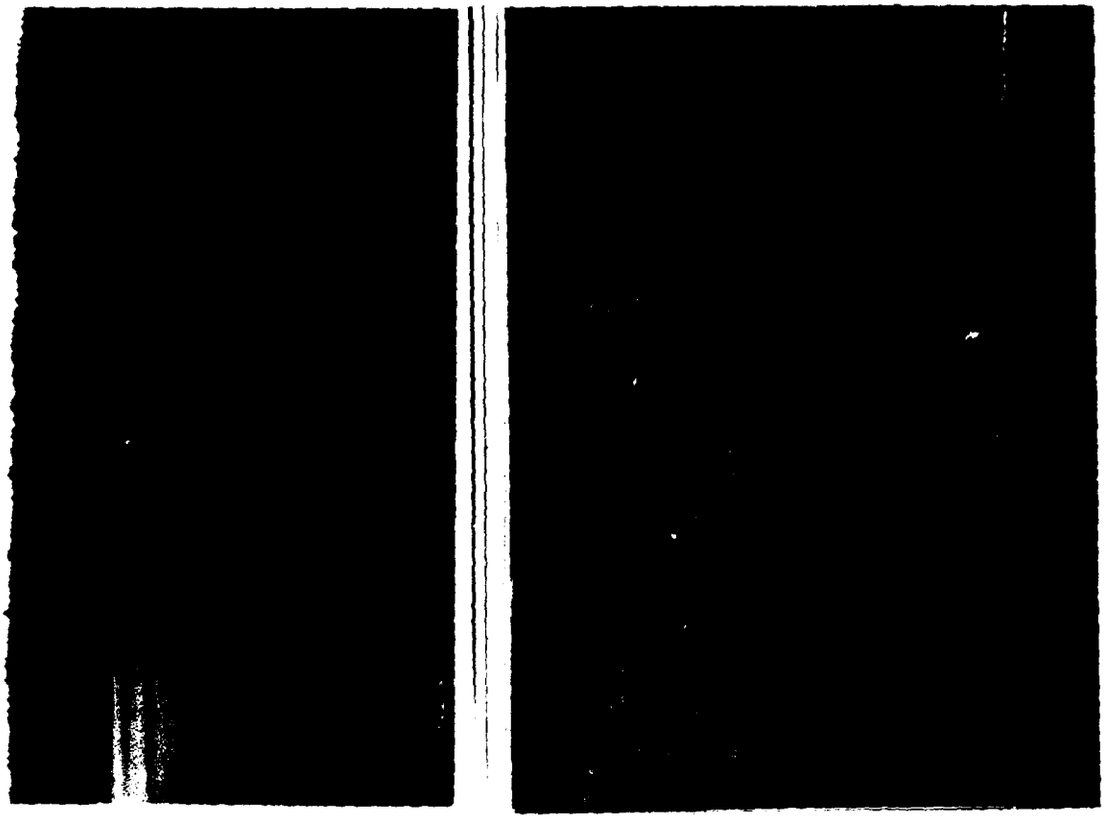
(1) Upper left - Upstream slope of dam.
(2) Upper right - Downstream slope of dam. Valve house at toe.
(3) Lower left - Seepage exiting downstream and to the right of valve house.
(4) Lower right - Discharge end of blow off pipes.

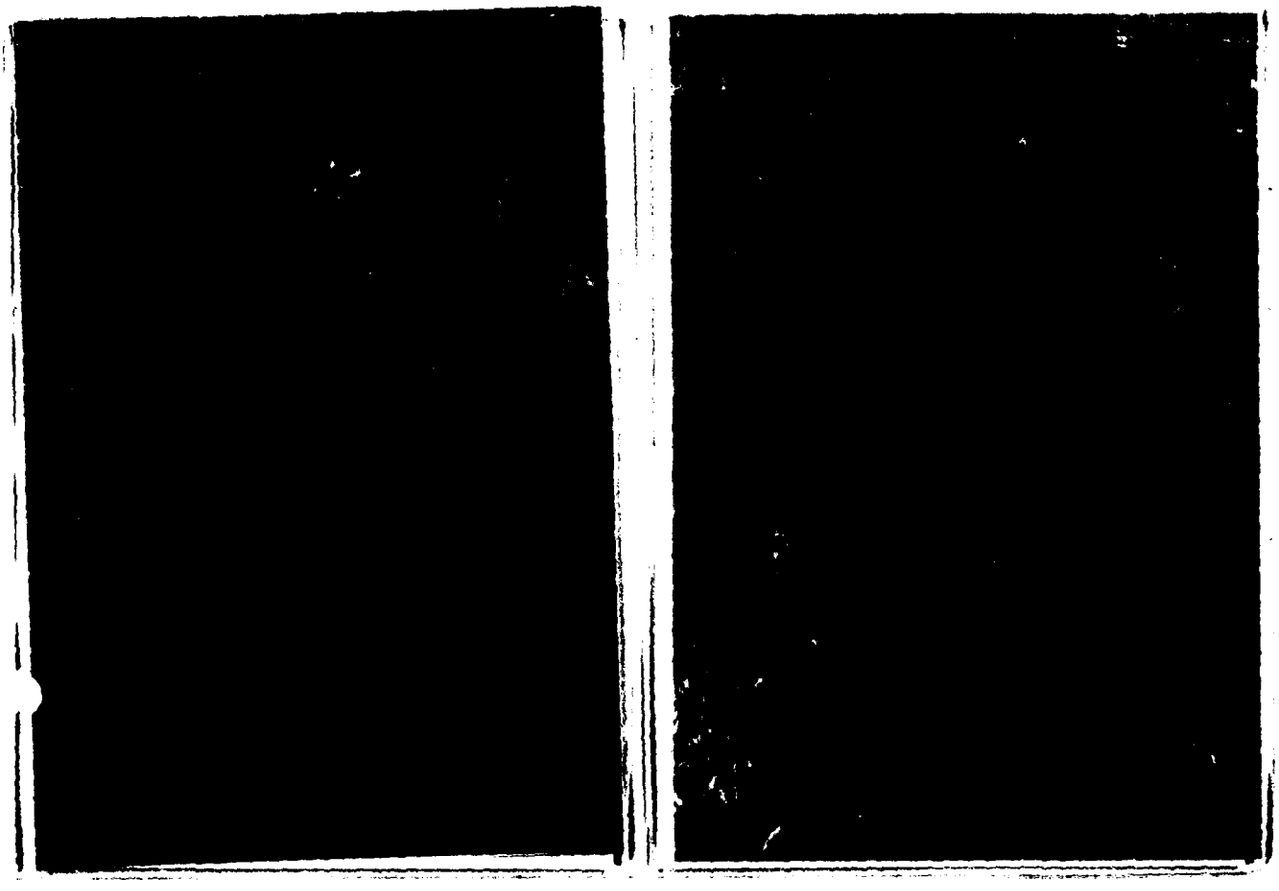
Sheet 1. Back

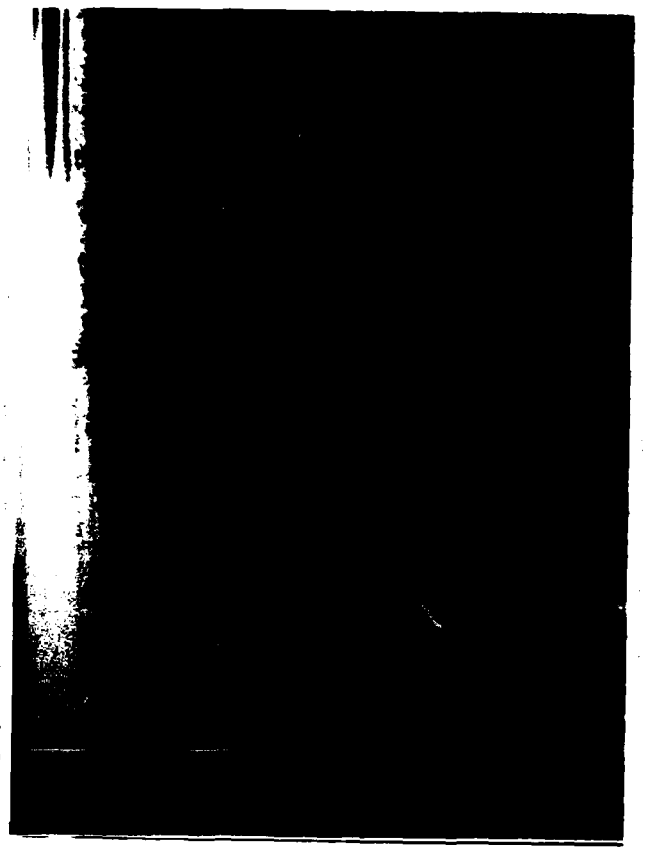
(5) Upper left - Spillway discharge channel.
(6) Upper right - Spillway weir.
(7) Lower left - Inside valve house. Note cracks in wall and seepage.
(8) Lower right - Downstream exposure.

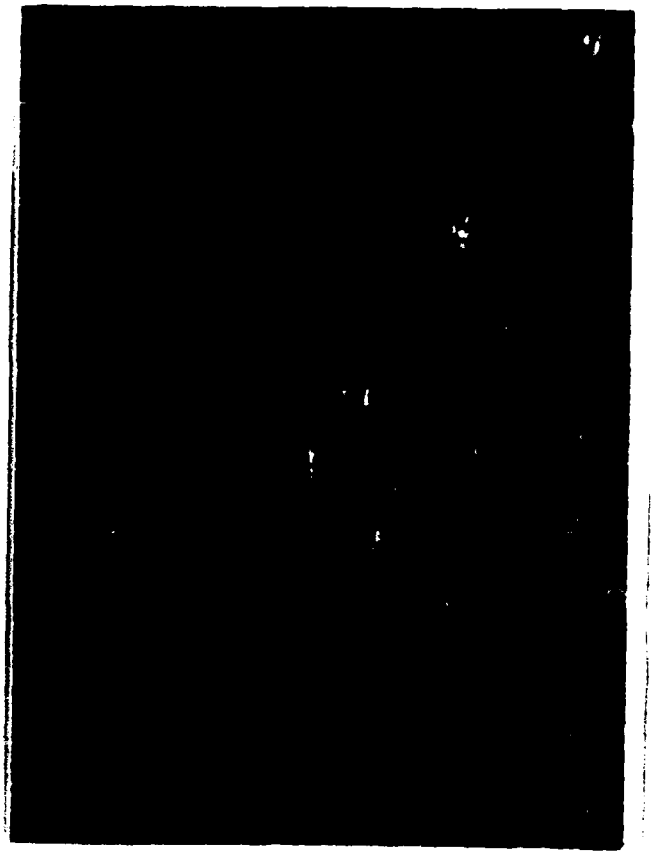
TOP OF PAGE

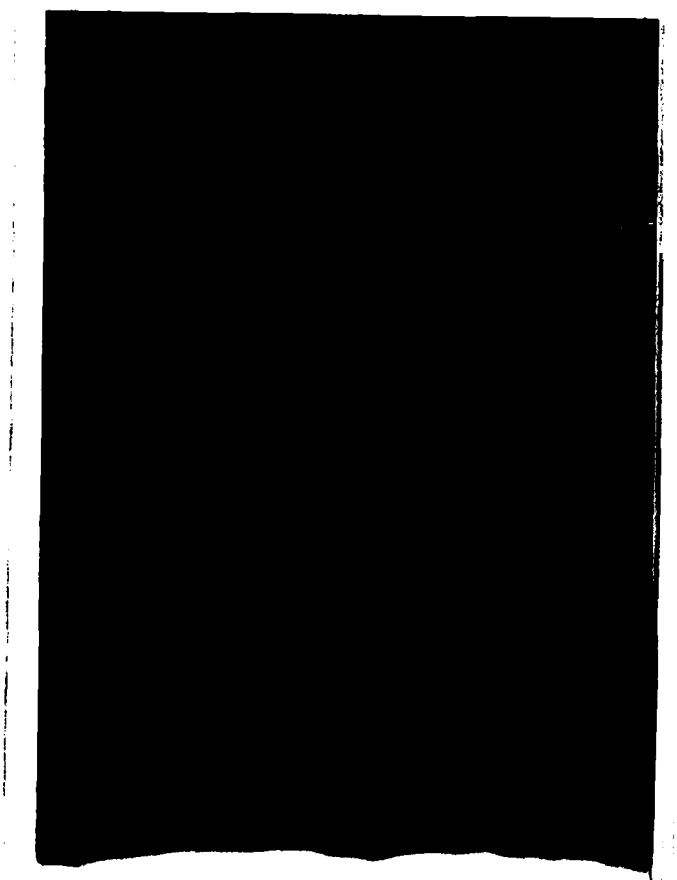


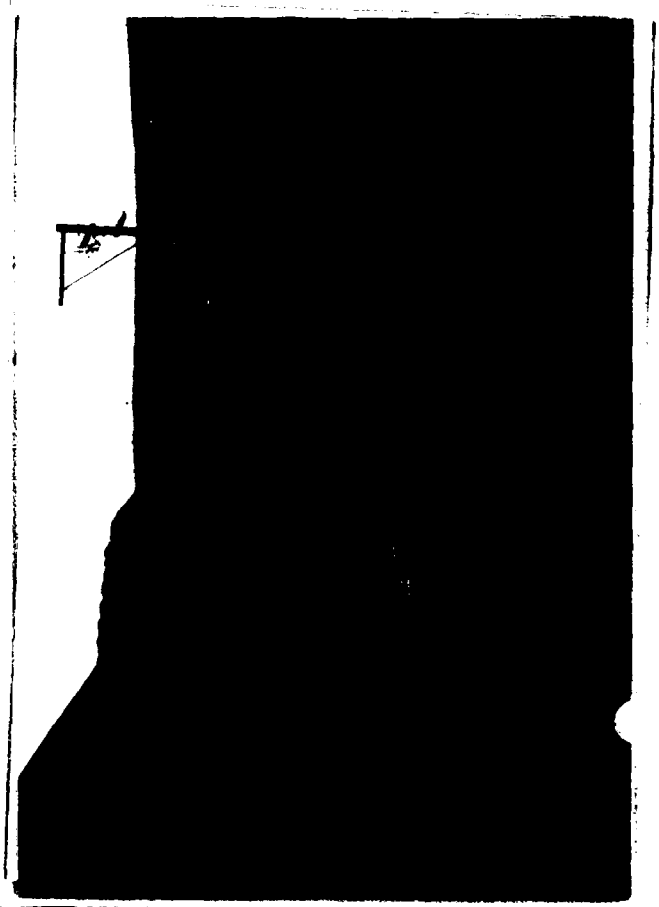












APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topgraphic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

HYDROLOGY AND HYDRAULICS ANALYSIS
DATA BASE

NAME OF DAM: Waste House Run No. 3 Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 (1.005) = 22.3 inches

STATION	1	2	3
Station Description	Waste House Run No. 3 Dam		
Drainage Area (square miles)	0.37		
Cumulative Drainage Area (square miles)	0.37		
Adjustment of PMF for Drainage Area (%)(1)			
6 hours	117		
12 hours	127		
24 hours	136		
48 hours	143		
72 hours	145		
Snyder Hydrograph Parameters			
Zone (2)	13		
Cp (3)	0.50		
Ct (3)	1.85		
L (miles) (4)	1.0		
Lca (miles) (4)	0.40		
tp = Ct(LxLca) 0.3 hrs.	1.41		
Spillway Data			
Crest Length (ft)	34' bottom		
Freeboard (ft)	2.7		
Discharge Coefficient	C' = 0.95		
Exponent	N/A		

(1) Hydrometeorological Report 40 (Figure 1), U.S. Army Corps of Engineers, 1965.
(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C_p and C_t).
(3) Snyder's Coefficients.
(4) L=Length of longest water course from outlet to basin divide. L_{ca}=Length of water course from outlet to point opposite the centroid of drainage area.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: DA-0.37 mi^2 Wooded, mild slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 193 ac-ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 239 ac-ft

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1715.7

SPILLWAY CREST:

a. Elevation 1713.0
b. Type Trapezoidal
c. Width 34'
d. Length Unknown
e. Location Spillover Right abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 20" CIP
b. Location Maximum section
c. Entrance inverts Unknown
d. Exit inverts Approximately 1675.5'
e. Emergency draindown facilities 20" CIP

HYDROMETEOROLOGICAL GAUGES:

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

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DAM NAME WASTE HOUSE RUN No. 3
I.D. NUMBER PA. 54-26
SHEET NO. 1 OF 3
BY OTM DATE 3-12-80

LOSS RATE AND BASE FLOW PARAMETERS

AS RECOMMENDED BY THE CORPS OF ENGINEERS, BALTIMORE DISTRICT.

STRTL = 1 INCH
CNSTL = 0.05 IN/HR
STRTQ = 1.5 cfs/mi²
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2.0

ELEVATION - AREA - CAPACITY RELATIONSHIPS

FROM U.S.G.S. 7.5-MIN. QUAD., DER FILES AND FIELD INSPECTION DATA.

AT SPILLWAY CREST ELEVATION = 1713'
INITIAL STORAGE = 192.5 AC.FT
POND SURFACE AREA = 15.2 AC

AT ELEV. 1720, AREA = 25.3 AC.
" " 1740, AREA = 53 AC

FROM THE CONIC METHOD FOR RESERVOIR VOLUME. FLOOD HYDROGRAPH PACKAGE (HEC-1). DAM SAFETY VERSION (USER'S MANUAL).

$H = 3V/A = 3(192.5)/15.2 = 38'$

ELEVATION WHERE AREA EQUALS ZERO;

1713' - 38' = 1675'

AREA (AC)	0	15.2	20	30	40	53
ELEV. (FT.)	1675	1713	1716	1723	1731	1740

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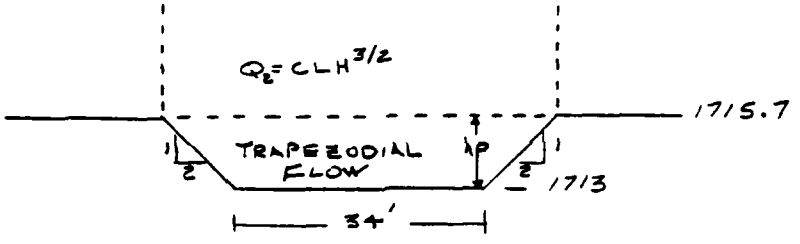
EBENSBURG PENNSYLVANIA

DAM NAME WASTE HOUSE RUN No. 3
I.D. NUMBER PA. 54-26
SHEET NO. 2 OF 3
BY O.T.M. DATE 3-12-80

DISCHARGE RATING CURVE



(NOT TO SCALE)

TRAPEZOIDAL FLOW
B = 34'
Z = 2
c' = 0.95
hp = VARIABLE

ASSUMED STANDARD WEIR FLOW
C = 3.1
L = 44.8'
H = VARIABLE

ELEV. (FT)	hp (Ft)	Q_1 (cfs)	h (FT)	Q_2 (cfs)	*Q (cfs)
1713	0	0			0
1714	1	104			100
1715	2	305			300
1715.7	2.7	491			490
1716			0.3	23	510
1717			1.3	206	700
1718			2.3	484	970
1720			4.3	1238	1730
1722			6.3	2196	2690
1725			9.3	3939	4430

* Q ROUNDED TO NEAREST 10 cfs.

WHERE: $Q = 8.03\, c'\, h_v (h_p - h_v)\left[B + Z(h_p - h_v)\right]$

$$h_v = 3(2Z h_p + B) - (16Z^2 h_p^2 + 16ZBh_p + 9B^2)^{1/2} / 10Z$$

FROM: WATER & WASTEWATER ENGINEERING (11-14) & (11-15)
BY FAIR, GEYER & OKUM 1966

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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME WASTE HOUSE RUN No. 3
I.D. NUMBER PA. 54-26
SHEET NO. 3 OF 3
BY OTM DATE 3-12-80

OVERTOP PARAMETERS

TOP OF DAM ELEV. (LOW SPOT) = 1715.7'
LENGTH OF DAM (EXCLUDING SPILLWAY) = 1050
COEFFICIENT OF DISCHARGE = 3.0 (BROAD CREST)
L_{MAX} = 1800'
Y_{MAX} = 1720'

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION  JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
     1     A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
     2     A2       HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF WASTEHOUSE RUN DAM NO. 5
     3     A3       RATIOS OF PMF ROUTED THROUGH THE RESERVOIR  (PA. 54-26)
     4     B   288      0      15       0       0       0       0       0       0       0
     5     B1    5
     6     J     1      6       1
     7     J1   .1     .2      .3      .4      .5      1
     8     K     0      1                                       1
     9     K1       YNFLOW
    10     M     1      1   0.37                                                        1
    11     P          22.3     117     127     136     143     145
    12     T                                                   1.0    0.05
    13     W   1.41    0.5
    14     X   -1.5   -.05     2.0
    15     K     1      2                                       1
    16     K1       ROUTE
    17     Y                                      1       1
    18     Y1    1                                                 -1713      -1
    19     Y4 1713   1714    1715   1715.7    1716    1717    1718    1720    1722    1725
    20     Y5    0    100     300     490     510     700     970    1730    2690    4430
    21     SA    0   15.2      20      30      40      53
    22     SE 1675   1713    1716    1723    1731    1740
    23     SS 1713
    24     SD1715.7    3.0     1.5     150
    25     SL  150    320     470    1020    1300    1500    1600    1800
    26     SV1?15.7   1716  1716.5    1717  1717.5    1718    1719    1720
    27     K    99
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN DATE= 80/03/05.
      TIME= 07.18.21.
```

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF WASTEHOUSE RUN DAM NO. 3
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR (PA. 54-26)

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	15	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 6 LRTIO= 1

RTIOS=	.10	.20	.30	.40	.50	1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

YNFLOW

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.37	0.00	.37	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.30	117.00	127.00	136.00	143.00	145.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.41 CP= .50 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.02 AND R= 7.78 INTERVALS

UNIT HYDROGRAPH 45 END-OF-PERIOD ORDINATES, LAG= 1.41 HOURS, CP= .50 VOL= 1.00

6.	20.	41.	62.	78.	85.	80.	70.	62.	54.
48.	42.	37.	32.	29.	25.	22.	19.	17.	15.
13.	12.	10.	9.	8.	7.	6.	5.	5.	4.
4.	3.	3.	2.	2.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.					

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1012.	673.	229.	78.	22521.
CMS	29.	19.	6.	2.	638.
INCHES		16.92	22.99	23.59	23.59
MM		429.85	584.05	599.23	599.23
AC-FT		334.	454.	465.	465.
THOUS CU M		412.	559.	574.	574.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	2	1	0	0	0	0	1	0	0

ROUTING DATA

OLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1713.	-1

STAGE	1713.00	1714.00	1715.00	1715.70	1716.00	1717.00	1718.00	1720.00	1722.00
//1725.00									
FLOW	0.00	100.00	300.00	490.00	510.00	700.00	970.00	1730.00	2690.00
4430.00									
SURFACE AREA=	0.	15.	20.	30.	40.	53.			
CAPACITY=	0.	193.	245.	419.	698.	1115.			
ELEVATION=	1675.	1713.	1716.	1723.	1731.	1740.			

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1713.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1715.7	3.0	1.5	150.

CREST LENGTH	150.	320.	470.	1020.	1300.	1500.	1600.	1800.	
AT OR BELOW									
ELEVATION	1715.7	1716.0	1716.5	1717.0	1717.5	1718.0	1719.0	1720.0	

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50	RATIO 6 1.00
HYDROGRAPH AT	1	.37	1	101.	202.	304.	405.	506.	1012.
		(.96)		(2.87)	(5.73)	(8.60)	(11.46)	(14.33)	(28.66)
ROUTED TO	2	.37	1	74.	164.	253.	345.	438.	996.
		(.96)		(2.11)	(4.65)	(7.17)	(9.77)	(12.41)	(28.21)

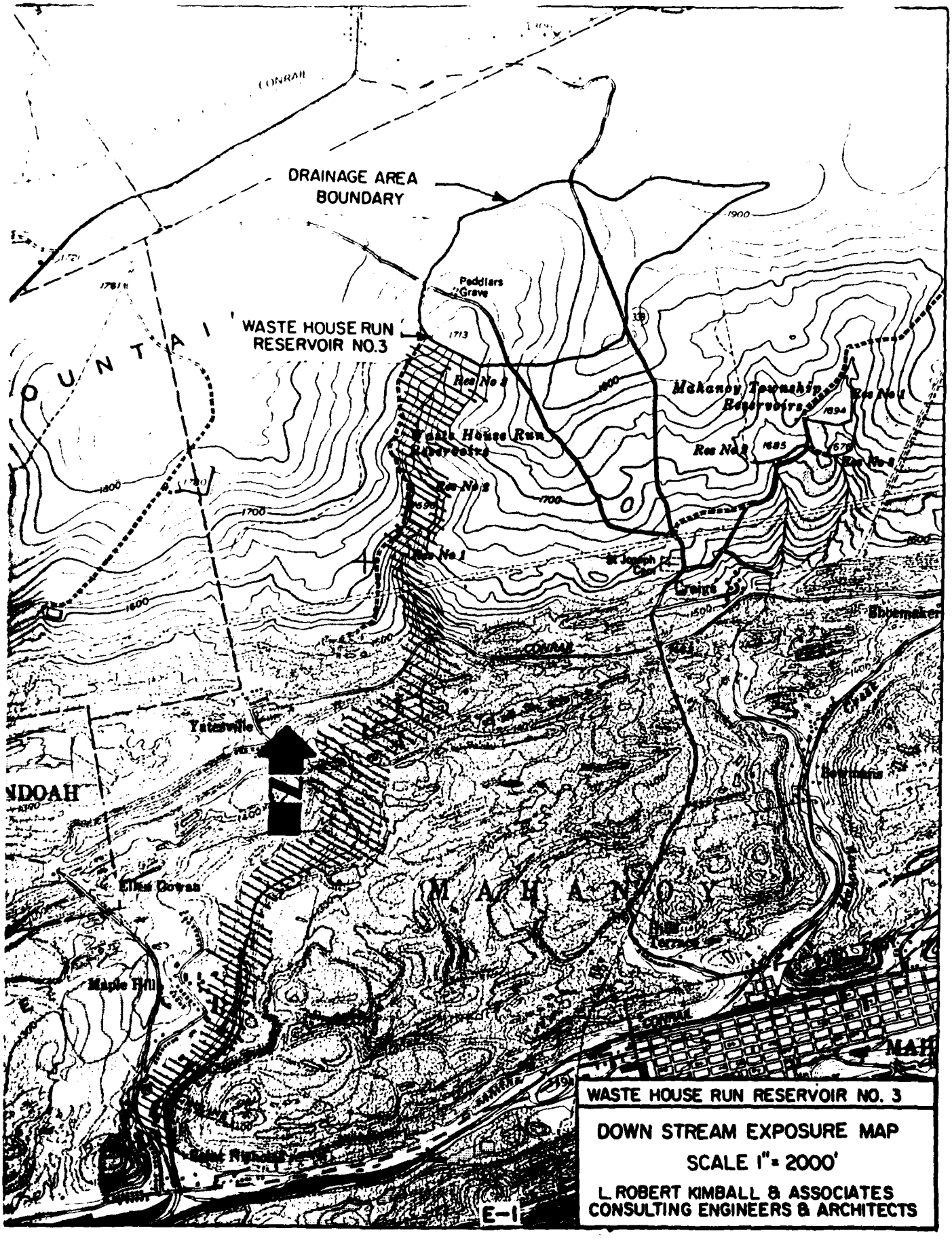
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ••••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1713.00	1713.00	1715.70
STORAGE	193.	193.	239.
OUTFLOW	0.	0.	490.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1713.74	0.00	204.	74.	0.00	42.75	0.00
.20	1714.32	0.00	214.	164.	0.00	42.25	0.00
.30	1714.77	0.00	222.	253.	0.00	42.25	0.00
.40	1715.17	0.00	229.	345.	0.00	42.00	0.00
.50	1715.51	0.00	236.	438.	0.00	42.00	0.00
1.00	1716.33	.63	252.	996.	4.25	41.25	0.00

APPENDIX E
DRAWINGS



WASTE HOUSE RUN RESERVOIR NO. 3

DOWN STREAM EXPOSURE MAP

SCALE 1" = 2000'

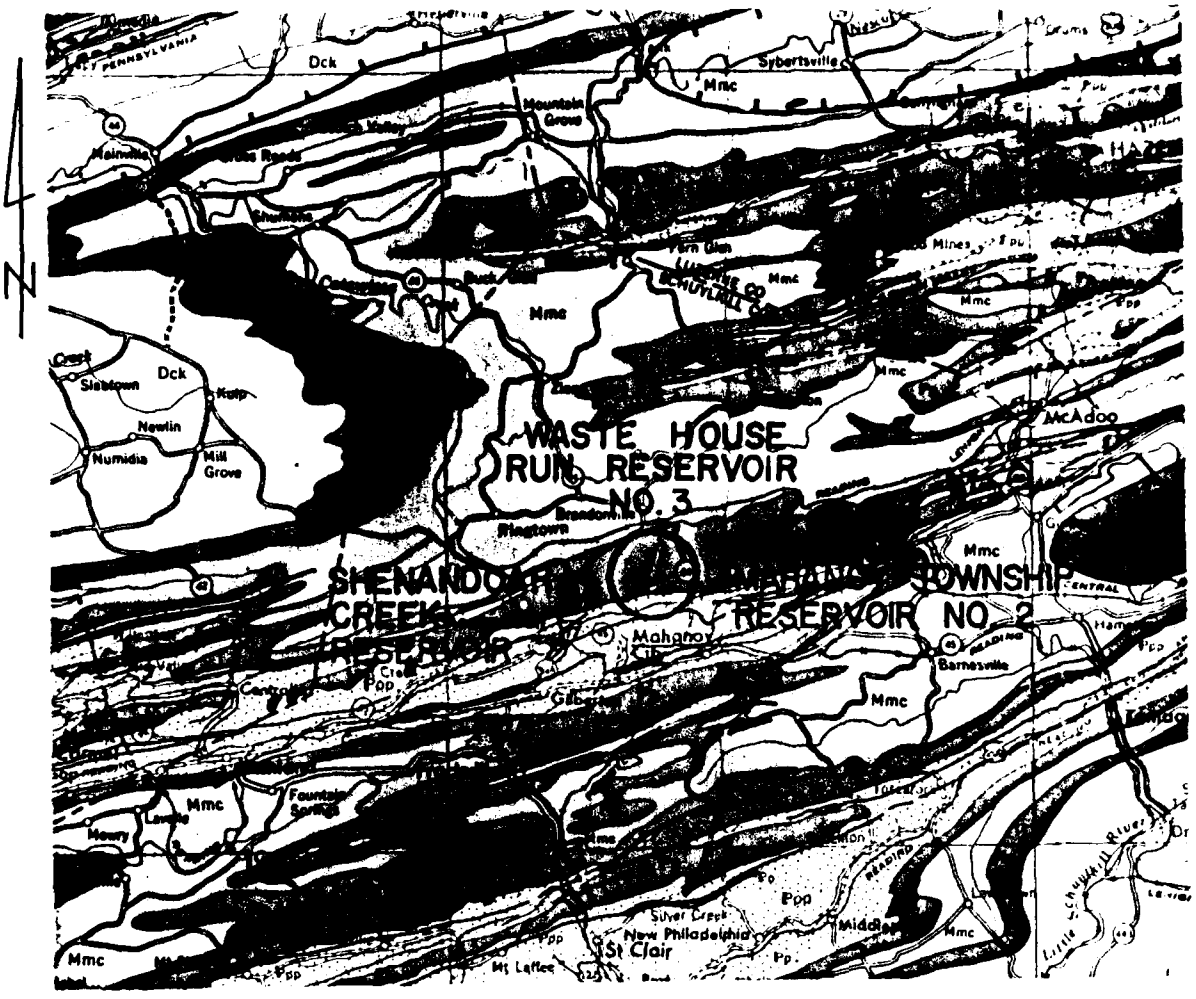
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

E-1

APPENDIX F
GEOLOGY

General Geology

The Waste House Run No. 3 Dam is located in the Applachian Mountain section of the Valley and Ridge Physiographic Province. This area is characterized by tightly folded synclines and anticlines. The bedrock underlying the dam and reservoir is the Pennsylvanian-aged Pottsville Group. This formation consist of interbedded sandstone and conglomerate, medium to coarse grained; with some coal and dark shale. The bedding is usually moderately-well developed. Joints are fairly regular, abundant and steeply dipping. The rocks comprising this formation are moderately resistant to weathering and form a good foundation for heavy structures if excavated to sound material. Care should be taken where coal has been mined. Some faulting is evidenced approximately two or three miles southeast and southwest of the reservoir.



GEOLOGIC MAP OF THE AREA AROUND SHENANDOAH CREEK, MAHANOY TOWNSHIP DAM NO. 2 AND WASTE HOUSE RUN NO. 3 RESERVOIRS

Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some minable coal. Includes Sharp Mountain, Schuylkill, and Tumbling Run Formations

Scale 1 : 250,000